

STATEMENT OF BASIS/FACT SHEET
(for Proposed Permit Limits - Renewal)

PERMITTEE: City of Laurel
PO Box 10
Laurel, MT 59044

PERMIT NO.: MT-0020311

RECEIVING WATERS: Yellowstone River

POPULATION: 1990 Census – 5686
2000 design capacity 7,000

A. Description of Discharge Points

The authorization to discharge provided under this permit is limited to those outfalls specifically designated below as discharge locations. Discharges at any location not authorized under an MPDES permit is a violation of the Montana Water Quality Act and could subject the person(s) responsible for such discharge to penalties under the Act. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge within a reasonable time from first learning of an unauthorized discharge could subject such person to criminal penalties as provided under Section 75-5-632 of the Montana Water Quality Act.

Outfall

<u>Serial Number</u>	<u>Description of Discharge Point</u>
001	At the end of the discharge pipe, emptying to Yellowstone River located approximately at 45° 39' 27" N latitude, 108° 45' 08" W longitude. The mixing zone consists of a segment of the Yellowstone River from the discharge point to approximately one mile downstream at 45° 39' 20" N latitude, 108° 43' 11" W longitude.

B. Effluent Limitations

1. Wastewater Effluent Requirements

Effective upon May 1, 2000 and lasting through March 31, 2005, the quality of effluent discharged through Outfall 001 shall, as a minimum, meet the limitations as set forth below:

Table 1: Outfall 001 Effluent Limits

Parameter	Concentration (mg/l) ⁽¹⁾		Allocated Annual Average Load (lb./day)
	7-Day Average	30-Day Average	
BOD ₅	45	30	220
TSS	45	30	220
Phosphorus, Total	Not Applicable	Not Applicable	49
Nitrogen, Total (as N)	Not Applicable	Not Applicable	196
Oil and Grease	10	15	ARM 17.30.637(1)(b)
Fecal Coliform Bacteria (organisms/100 m/)	Not Applicable	54,000 ⁽²⁾	Not Applicable

⁽¹⁾ See the definitions in Part I.A for explanation of terms.

⁽²⁾ This limitation applies from the period beginning April 1 and ending October 31. 10% of samples may not exceed 118,000 organisms/100 m/ during any 30-day month.

The instantaneous maximum limitation for Total Chlorine in any grab sample shall be 0.5 mg/L. (ARM 17.30.637(1)(d))

The acute toxicity measured in the effluent shall not exceed 8.8 Toxic Units Acute (TUA). (ARM 17.30.637(1)(d))

The Fecal Coliform effluent limitations are based upon compliance with the Montana Surface Water Quality Standards. (ARM 17.30.624(2)(a))

Effluent pH shall remain between 6.0 and 9.0 unless a variation is due to natural biological processes. For compliance purposes, any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of this permit. (ARM 17.30.624(2)(c))

The arithmetic mean of the BOD₅ and total suspended solids (TSS) for effluent samples collected in a period of 30 consecutive days shall not exceed 15% for TSS and 20% for BOD₅ of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85% removal for TSS and 80% removal for BOD₅). This is in addition to the concentration limitations on BOD₅ and total suspended solids. These effluent limitations are based upon 40 CFR Part 133, Secondary Treatment Regulations, Sept. 20, 1984: BOD₅, TSS, pH and Percent Removal.

There shall be no discharge of floating solids or visible foam in other than trace amounts. (ARM 17.30.637(1)(b))

There shall be no discharge which causes visible oil sheen in the receiving stream. (ARM 17.30.637(1)(b))

2. Sewage Sludge Requirements

Effective immediately and lasting through March 31, 2005, the quality of disposed sludge shall, as a minimum, meet the limitations as set forth below.

- a. The permittee shall handle and dispose of sewage sludge in such a manner so as to protect public health and the environment.
- b. Land Application of Sewage Sludge

Sewage sludge, which is disposed of on land, shall meet all applicable requirements of 40 CFR Part 503 within one year of promulgation of these rules unless significant construction is required.

Sewage sludge which is disposed of in a municipal solid waste landfill shall meet all applicable requirements of 40 CFR Part 258. The permittee must submit information verifying that 40 CFR Part 258 is being met (see III.F.3).

Only sewage that meets the minimum requirements listed in I.C.2 shall be applied to land used for the production of food-chain crops (40 CFR 257.3-5, 3-6, and Appendix II).

C. Self-Monitoring Requirements

1. Wastewater Monitoring

As a minimum, upon the effective date of this permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. If no discharge occurs during the entire monitoring period, it shall be stated on the Discharge Monitoring Report Form (EPA No. 3320-1) that no discharge or overflow occurred.

Table 2: Outfall 001 Monitoring Requirements

Parameter	Frequency	Type ⁽¹⁾
Effluent Flow Rate, mgd	Continuous	Recorded
BOD ₅ ⁽²⁾	Two Times Per Week	Composite
TSS ⁽²⁾	Two Times Per Week	Composite
pH	Daily	Grab
Fecal Coliform Bacteria ⁽³⁾ (organisms/100 m/L)	Weekly	Grab
Acute Toxicity	Quarterly	Composite
Total Residual Oxidant as Chlorine ⁽⁶⁾	Daily	Grab
Total Phosphorus	Monthly	Composite

Parameter	Frequency	Type ⁽¹⁾
Total Ammonia (as N)	Monthly	Composite
Nitrate + Nitrite (as N)	Monthly	Composite
Total Kjeldahl Nitrogen	Monthly	Composite
Total Nitrogen (as N) ⁽⁴⁾	Monthly	Calculated
Monthly Average Load, BOD ₅	Monthly	Calculated
Monthly Average Load, TSS	Monthly	Calculated
Monthly Average Load, Phosphorus	Monthly	Calculated
Monthly Average Load, Nitrogen	Monthly	Calculated
Percent Removal BOD ₅ ⁽⁵⁾	Monthly	Calculated
Percent Removal TSS ⁽⁵⁾	Monthly	Calculated

(1) See the definitions in Part I.A. of the permit.

(2) In addition to monitoring the final discharge, influent samples shall be taken and analyzed for this constituent at a frequency of once per week.

(3) Fecal coliform monitoring is required only from April 1 to October 31 each year.

(4) Calculated by finding the sum of [Nitrate + Nitrite] and [Total Kjeldahl Nitrogen] concentrations.

(5) Percent removal shall be calculated using the monthly average values.

(6) Required only when the disinfection process is active.

2. Sludge monitoring requirements

As a minimum, upon the effective date of this permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the sewage sludge.

Sludge monitoring requirements if sludge disposal is to a municipal solid waste landfill:

Table 3: Sludge Monitoring Requirements

Material	Parameter, Units	Frequency
Sludge	TCLP-metals ⁽¹⁾ , (Pass/Fail)	1 test/five years
	Paint Filter Test, (Pass/Fail)	Annually
	Total Sludge Disposed, (metric tons)	Annually
	Percent Solids, (%)	Annually

(1) If the TCLP sample shows that the sewage sludge does not qualify as hazardous waste (see 40 CFR 261.3), the permittee may request that the TCLP monitoring requirement be eliminated.

3. Whole Effluent Toxicity Testing - Acute Toxicity

Starting in the first calendar quarter following the effective date of the permit, the permittee shall, at least once each calendar quarter conduct an acute static renewal toxicity test on a dechlorinated or prechlorinated composite sample of the effluent. Testing will employ one species per quarter and the permittee shall alternate between the two test species from one quarter to the next. Samples shall be collected on a two day progression; i.e., if the first yearly sample is on a Monday, the second yearly sample shall be on a Wednesday, etc. Saturdays, Sundays and Holidays will be skipped in the progression.

The toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, EPA-600/4-90/027 and the Region VIII EPA NPDES Acute Test Conditions - Static Renewal Whole Effluent Toxicity Test testing protocols. The permittee shall conduct an acute 48-hour static renewal toxicity test using *Ceriodaphnia sp.* and an acute 96-hour static renewal toxicity test using fathead minnows (*Pimephales promelas*) as the alternating species. The control of pH in the toxicity test utilizing CO₂ enriched atmospheres is allowed to prevent rising pH drift. The target pH selected must represent the pH value of the combination of effluent and receiving water at the dilution that corresponds to the toxicity limitation. This target pH value is determined before the actual toxicity sample is collected by preparing a one liter mixture of effluent and receiving water at the concentration representing the toxicity limitation. The mixture is allowed to equilibrate in a beaker at room temperature for three hours. At the end of this period, the pH is measured and reported to the laboratory conducting the toxicity analysis.

The acute toxicity measured in the effluent shall not exceed the effluent limitation expressed in Toxic Units Acute (TU_a). If more than 10 percent control mortality occurs, the test is considered invalid and shall be repeated until satisfactory control survival is achieved, unless the Department grants a specific individual exception. This exception may be granted if less than 10 percent mortality was observed at the dilutions containing high effluent concentrations.

If acute toxicity exceeds the effluent limitation in a routine test, an additional test shall be conducted within two weeks of the date when the permittee is informed of the exceedence. Should acute toxicity exceed the effluent limitation in the second test, testing shall occur once a month until further notified by the Department.

The quarterly test results from the laboratory shall be reported along with the Discharge Monitoring Report (DMR) form submitted for the end of the reporting calendar quarter (e.g., whole effluent results for the reporting quarter ending March 31 shall be reported with the March DMR due April 28, with the remaining quarterly reports submitted with the June, September, and December DMRs). The format for the laboratory report shall be consistent with the latest revision of the EPA form Region VIII Guidance for Acute Whole Effluent Reporting, and shall include all chemical and physical data as specified.

4. Toxicity Reduction Evaluation (TRE) Toxicity Identification Evaluation (TIE)

Should the effluent exceed the acute toxicity limitation in a routine test and is confirmed by the additional test, a TIE-TRE shall be undertaken by the permittee to establish the cause of the toxicity, locate the source(s) of the toxicity, and develop control of, or treatment for the toxicity. Failure to initiate, or conduct an adequate TIE-TRE, or delays in the conduct of such tests, shall not be considered a justification for noncompliance with the whole effluent

toxicity limits contained in Part I.C.1 of this permit. A TRE plan needs to be submitted to the permitting authority within 45 days after confirmation of the continuance of the effluent toxicity.

D. Past Discharge Data

See yearly self-monitoring summaries in file.

Table 4: Outfall 001 Discharge Volume (30 day average

Month	Discharge (mgd)	Month	Discharge (mgd)	Month	Discharge (mgd)
1995 Jan	.704	1996 Jan	.771	1997 Jan	.893
Feb	.683	Feb	.707	Feb	.825
Mar	.776	Mar	.727	Mar	.853
Apr	.847	Apr	.759	Apr	1.016
May	1.249	May	.922	May	1.174
Jun	1.465	Jun	1.462	Jun	1.963
Jul	1.708*	Jul	1.667	Jul	2.403*
Aug	1.699	Aug	1.773*	Aug	1.829
Sep	1.155	Sep	1.420	Sep	1.462
Oct	.818	Oct	.814	Oct	1.236
Nov	.746	Nov	.780	Nov	.820
Dec	.758	Dec	.808	Dec	.781
Average	1.05	Average	1.05	Average	1.27

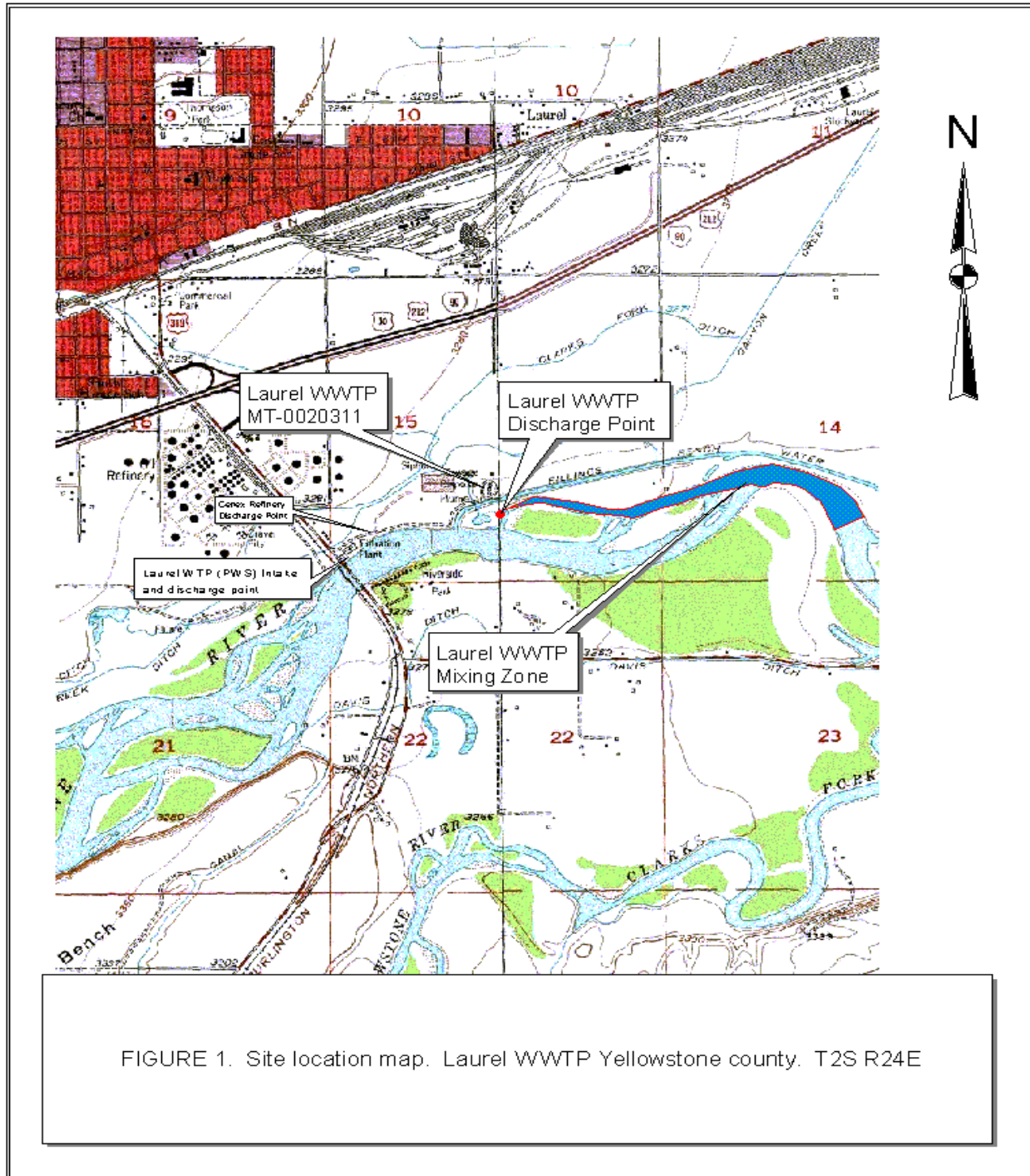
Month	Discharge (mgd)	Month	Discharge (mgd)	Month	Discharge (mgd)
1998 Jan	.783	1999 Jan	.724		
Feb	.803	Feb	.777		
Mar	.807	Mar	.733		
Apr	.777	Apr	.708		
May	1.437	May	1.068		
Jun	1.523	Jun	1.328		
Jul	2.094*	Jul	1.835*		
Aug	1.806	Aug	1.704		
Sep	1.404	Sep	1.22		
Oct	.987	Oct	.826		
Nov	.790				
Dec	.720				
Average	1.16	Average		Average	

* Maximum monthly flow

$$\text{Average Maximum Flow, 1995 - 1999} = \frac{(1.71 + 1.77 + 2.4 + 2.09 + 1.84)}{5} = 1.96 \text{ mgd}$$

E. Existing Facilities

This facility consists of a rotating biological contactor (RBC) type secondary treatment facility. Primary treatment consists of mechanical bar screen, aerated grit chamber, two primary clarifiers and two anaerobic digesters. Discharge is to the Yellowstone River. (Figure 1)



F. Water Quality Standards Discussion

The Yellowstone River in the area of discharge is classified B-2, Drainage Basin 43Q and Waterbody No. 43QJ0011.

The 7 day, 10 year low flow of the Yellowstone River at Laurel, Montana is estimated at 973 cfs = 630 mgd. The closest gauging station to Laurel on the Yellowstone is at Billings approximately 20 miles downstream. The Clarks Fork of the Yellowstone enters the Yellowstone River approximately 3 miles below Laurel. The 7Q10 was estimated by subtracting the 7Q10 measured at the USGS gauging station at Edgar, Mt on the Clarks Fork of the Yellowstone No. 06208500 (117 cfs) from the 7Q10 measured at the USGS gauging station at Billings, MT No. 06214500 (1,090 cfs). The period of record at the Edgar station is from 1923-69 and 1988-94. The period of record at the Billings station is from 1930-94. The 7Q10 in the previous permit was stated as 860 cfs or 556 mgd. It was stated that the data came from the gauging station in Billings.

Effluent Pollutant Limits - Basis for Calculations

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1Q_1}{Q_2}$$

Effluent limits for typical pollutants will be checked against State standards as listed in Circular WQB-7. The following equation will be used to assess the impact to the receiving waters.

- C₁ = background concentration, mg/l
- C₂ = allowable discharge concentration, mg/l
- C₃ = instream concentration limit for pollutant (from Circular QB-7 or other appropriate chronic standard)
- Q₁ = 7Q₁₀ = 7-day, 10-year, low-flow value of the receiving stream
- Q₂ = maximum flow of discharge (peak or average of highest flows over time)

Fecal Coliform Bacteria Limit

The instream concentration of fecal coliform was determined to be 33-organisms/100 ml. This value is the geometric mean of 92 fecal coliform samples collected during the months of April through October 1974-1979 (STORET data base). Samples were collected at two locations approximately 1,500 feet upstream of Outfall 001 at 45°39'15" N latitude, 108°45'32" W longitude and 45°39'19" N latitude, 108°45'30" W longitude.

- C₁ = 33 organisms/ml.
- C₃ = instream fecal coliform limit for B-2 classification = 200 organisms/100 ml (case 1) and 400 organisms/100 ml for less than 10% of the samples collected during any 30-day period (case 2) (for water temperature > 60°F, (15.6°C).
- Q₁ = 7Q₁₀ = 630 mgd
- Q₂ = mean high discharge rate from the facility = 1.96 mgd

Case 1:

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1Q_1}{Q_2} = \frac{200(630 + 1.96) - (33)(630)}{1.96} = 53,878 \text{ organisms / 100ml}$$

Case 2:

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1Q_1}{Q_2} = \frac{400(630 + 1.96) - (33)(630)}{1.96} = 118,364 \text{ organisms / 100ml}$$

We will use 54,000 organisms/100 ml as the fecal coliform limit for the monthly mean. The geometric mean of 10% of the samples collected during any 30-day period may not exceed 118,000 organisms/100 ml. (ARM, 17.30.624(2)(a)) This limit will be applied from April 1 to October 31 of each year when the temperature of Yellowstone River may exceed 60°F. (WPB Policy No. 4) *The previous permit assumed zero organisms instream due to lack of instream data.*

Total Residual Chlorine Limit

Water Quality Criteria WQB-7 lists a chronic criteria value for fresh water at 0.011mg/L chlorine. It is assumed that the instream concentration is zero.

$$\text{Allowable Cl}_2 : \frac{0.011(630 + 1.96) - 0}{1.96} = 3.55 \text{ mg / l}$$

Due to the highly toxic nature of chlorine and the available technology to essentially eliminate it from a wastewater discharge the Water Protection Bureau Policy is to not allow a maximum chlorine concentration greater than 0.5 mg/L which will be the limit.

Ammonia Toxicity Limit

The ammonia toxicity was determined using average values for the more critical months of August, low flows, higher temperatures and pH and the winter month's low flows but also lower temperatures. (WPB Ammonia Toxicity Policy #24)

From STORET data, on a yearly average, total ammonia background concentration in the river is 0.14 mg/L. Maximum July - August temperature instream is 20°C, median pH instream is about 8.75. The monthly 7Q10 for the Yellowstone River at Laurel for August is 2,102 cfs or 1,358 mgd (2,252 at Billings - 150 cfs for Clarks Fork). Using the equations in WQB-7 (Note No. 7) the ammonia chronic toxicity limit was determined to be 0.19 mg/L. (Data from previous permit)

$$\text{Using the August monthly 7Q10 the limit would be: } \frac{0.19(1,358 + 1.96) - (0.14)(1,358)}{1.96} = 35 \text{ mg / L}$$

For the winter months a colder temperature of 10° C was used in the calculation of ammonia toxicity the pH was kept at 8.75. The wintertime ammonia toxicity was calculated at 0.26 mg/L.

$$\text{Using the yearly 7Q10 the limit would be: } \frac{0.26(630 + 1.96) - (0.14)(630)}{1.96} = 38.8 \text{ mg / L}$$

The highest ammonia detected in the effluent from 1996 through 1999 was 16.9 mg/L. Given the conservative assumptions used to generate the ammonia toxicity of 35 mg/L it is not expected that this will ever be exceeded, therefore, an ammonia limit will not be necessary.

Acute Toxicity Limit

Beginning in the first calendar quarter following the effective date of the permit, the permittee must conduct acute static renewal toxicity tests on a dechlorinated or prechlorinated composite sample of the effluent on a quarterly basis. Two species (one crustacean and one fish) will be utilized on an alternating basis using one species per quarter. These will be *Ceriodaphnia sp.* and fathead minnows (*Pimephales promelas*) unless otherwise approved by the Department.

The EPA in-stream criterion for acute toxicity protection is 0.3 toxicity units (TUa). It is assumed that the instream toxicity concentration is zero. The “minimal initial dilution” is 10% of the 7Q10 (10% of 630 mgd = 63.0 mgd).

$$\text{Allowable Acute Toxicity} : \frac{0.3(63.0+1.96)-0}{1.96} = 9.9 \text{ TUa}$$

The acute toxicity effluent limitation for the Laurel effluent based upon the above calculation will be stated as follows: **The acute toxicity measured in the effluent shall not exceed 9.9 Toxic Units Acute (TUa).**

G. Mixing Zone

The effluent mixing zone has not been changed from the previous permit, approximately one mile downstream from the discharge point. There is no evidence that the previously allowed mixing zone has impaired existing or anticipated uses so the present mixing zone has been retained. (ARM 17.30.505(1)(c)).

H. Non-degradation

The segment of the Yellowstone River from Billings to Columbus was assessed for impairment and TMDL development in December of 1998. The segment was listed on the Montana’s 303(d) list and given a low priority for TMDL development. The assessment found partial support for aquatic life, drinking water supply and cold water fishery. The probable causes of impairment were listed as metals, nutrients and suspended solids. The sources were listed as agriculture, industrial and municipal point sources and natural conditions.

Waste load allocations calculated from actual discharge conditions and design criteria prior to April 29, 1993 will help define and serve to support a future TMDL for the Yellowstone River and define baseline waste load allocations for this facility.

Using revision 3 of "Guidelines for Calculating Nondegradation Load Limits (waste load allocations) for Existing POTW's Under the Nondegradation Rules," 10/19/94, we can calculate a daily load limit for BOD₅, TSS, total nitrogen and total phosphorus to satisfy non-degradation requirements. Exceedences of these allocations in the future will be considered a new and increased source and will have to meet nondegradation criteria under ARM 13.30.715 and MCA 75-5-303. For BOD and TSS these loads are based on the lowest of either design flows times the concentration limits (method 1) or the design population times the percapita input (method 2). For nutrients the loads are based on the design population times the percapita input (method 2).

The design capacity for the Laurel WWTP is 0.88 mgd. *The previous permit stated the design*

capacity was 1.5 mgd. The last two applications have stated the design capacity is 0.88 mgd. For the purpose of future nondegradation requirements the design capacity as of April, 1993 of 0.88 mgd will be used in the calculations. The design population for the year 2,000 is 7,000 people. The design BOD and TSS loads were calculated using a per/capita per/day load of 0.20 lbs. and 0.22 lbs. respectively. These daily loads equal 1,400 lbs. and 1,540 lbs. respectively. (Circular DEQ 2, Design Standards for Wastewater Facilities, Chapter 10, 11.253) The previous permit used a per/capita/day load of 0.21 lbs. and 0.23 lbs. respectively. Furthermore an error was made in calculating the total lbs. per day for both parameters in the previous permit.

Method 1, Concentration Limitations:

BOD Load Limit = Design flow (mgd) x BOD₅ Permit Limit (mg/l) x 8.34

BOD Load Limit = 0.88 mgd x 30 mg/l x 8.34 = 220 lb./day

TSS Load Limit = 0.88 mgd x 30 mg/l x 8.34 = 220 lb./day

Method 2, Percent Removal Limitation:

Design BOD₅ Load = 1,400 lb./day

Design BOD₅ Load Limit (80% Removal) = 1,400 x 0.2 = 280 lb./day

Design TSS Load = 1,540 lb./day

Design TSS Load Limit (85% Removal) = 1,540 x 0.15 = 231 lb./day

The loads for BOD and TSS are lowest using method 1; therefore they will be used to calculate future exceedences of the waste load allocation.

Nitrogen and Phosphorus Load Limits:

Equivalent Design Population (yr. 2000) 7,000

Total Nitrogen Load Limit = 7,000 x 0.028 lbs./day/capita = 196 lb./day

Total Phosphorus Load Limit = 7,000 x 0.007 lbs./day/capita = 49 lb./day

The highest yearly average daily load over the last three years for BOD was 186 lb./day, for TSS 186 lb./day, for total nitrate as N (combining nitrate plus nitrite and TKN) 152 lb./day and for total phosphorous 32 lb./day.

I. Miscellaneous Discussion

The design flow capacity for the facility is 0.88 mgd. Presently the facility is discharging an average maximum flow of 1.96 mgd. A letter dated May 14, 1999 from Duke Nieskens, Plant Superintendent, indicated that there may be significant amount of infiltration and inflow (I/I) entering the system. The city is taking steps to quantify and solve the problem.

Because of the excessive I/I the percent removal of BOD stipulated in CFR 133.102(a)(3) of 85% was reduced to 80%. This was done in a previous permit because at dilute concentrations of BOD the percent removal criteria is difficult to achieve. Concentration limits and waste load allocation amounts protect instream water quality.

Public Notice

APPLICANT NAME: City of Laurel
APPLICANT ADDRESS: PO Box 10, Laurel, MT 59044
APPLICANT STATUS: MPDES Permit Renewal
FACILITY LOCATION: Yellowstone County, Section 15, R24E, T2S
PERMIT NUMBER: MT-0020311
EXPIRATION DATE: March 31, 2005
RECEIVING WATERS: Yellowstone River

This application is for renewal of a discharge permit for the wastewater treatment facility which serves Laurel, Montana. The application is for one existing discharge of treated domestic wastewater. The wastewater treatment facility consists of a rotary biological contactor (RBC) type secondary treatment facility. Primary treatment consists of mechanical bar screens, aerated grit chamber, two primary clarifiers and two anaerobic digesters.

Discharge is to Yellowstone River which is classified "B-2" by the Montana Surface Water Quality Standards. Waters classified B-2 are considered suitable for drinking, culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. Effluent limitations will ensure that the Montana Surface Water Quality Standards and National Secondary Treatment Standards will be met.

The proposed permit requires periodic self-monitoring of discharge quality and quantity with the reporting of results monthly. The recommended expiration date for the permit is March 31, 2005.